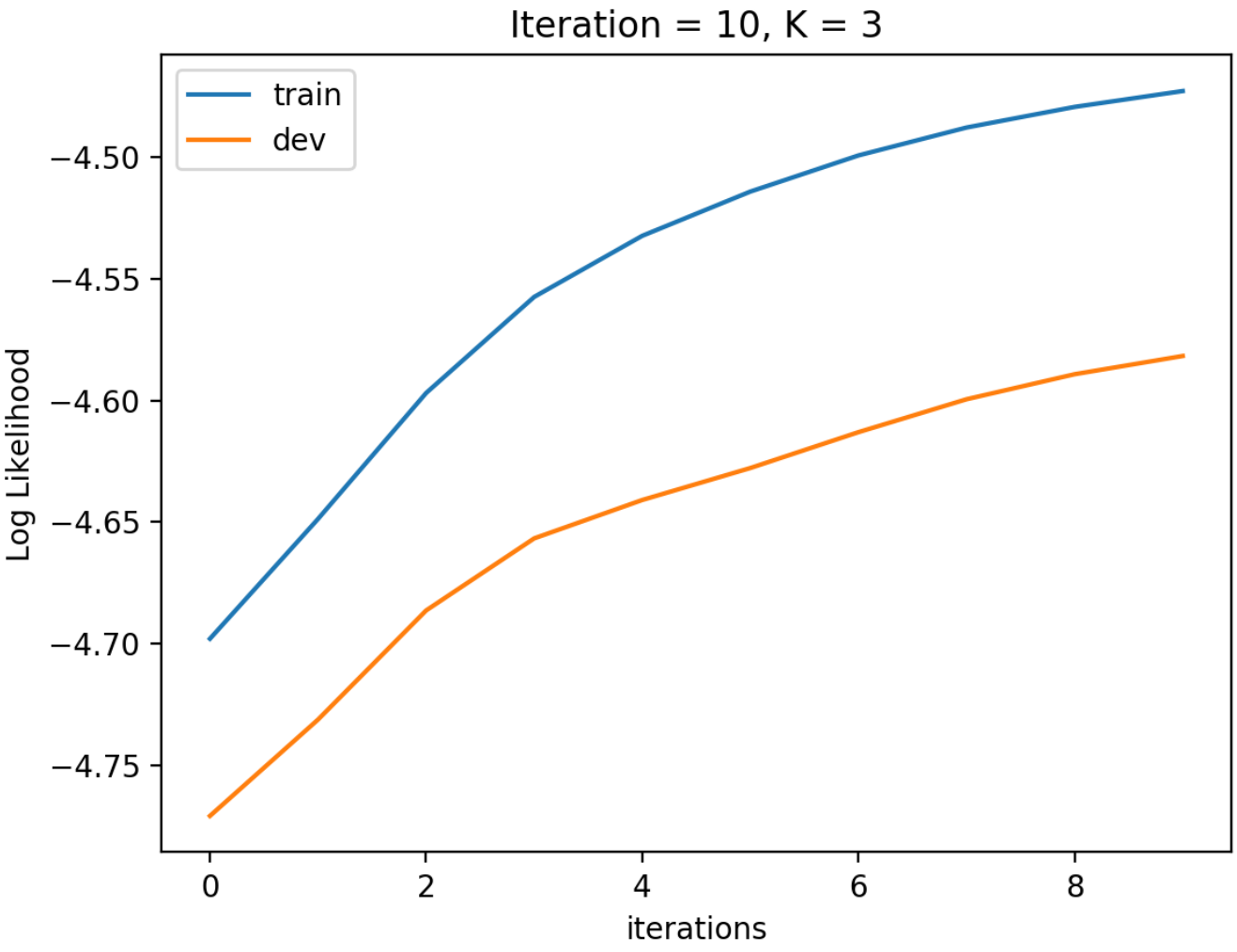
CSC 446, HW#7, Kefu Zhu

Tuning of `--iterations`

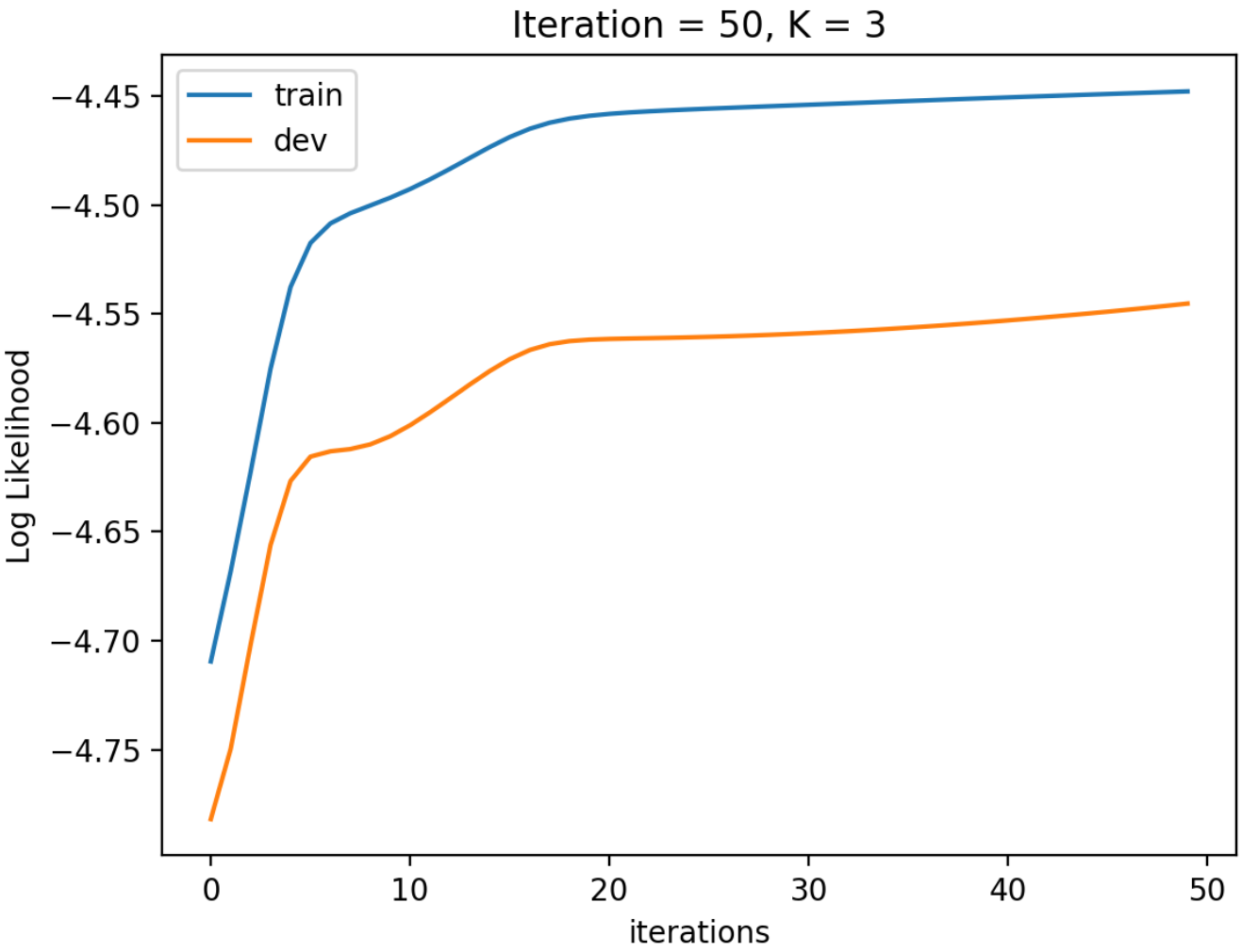
To tune the optimal number of iterations, I first pick the `--cluster_num` to be 3 and try training the model with different number of iterations (`--iterations`)

Iteration = 10



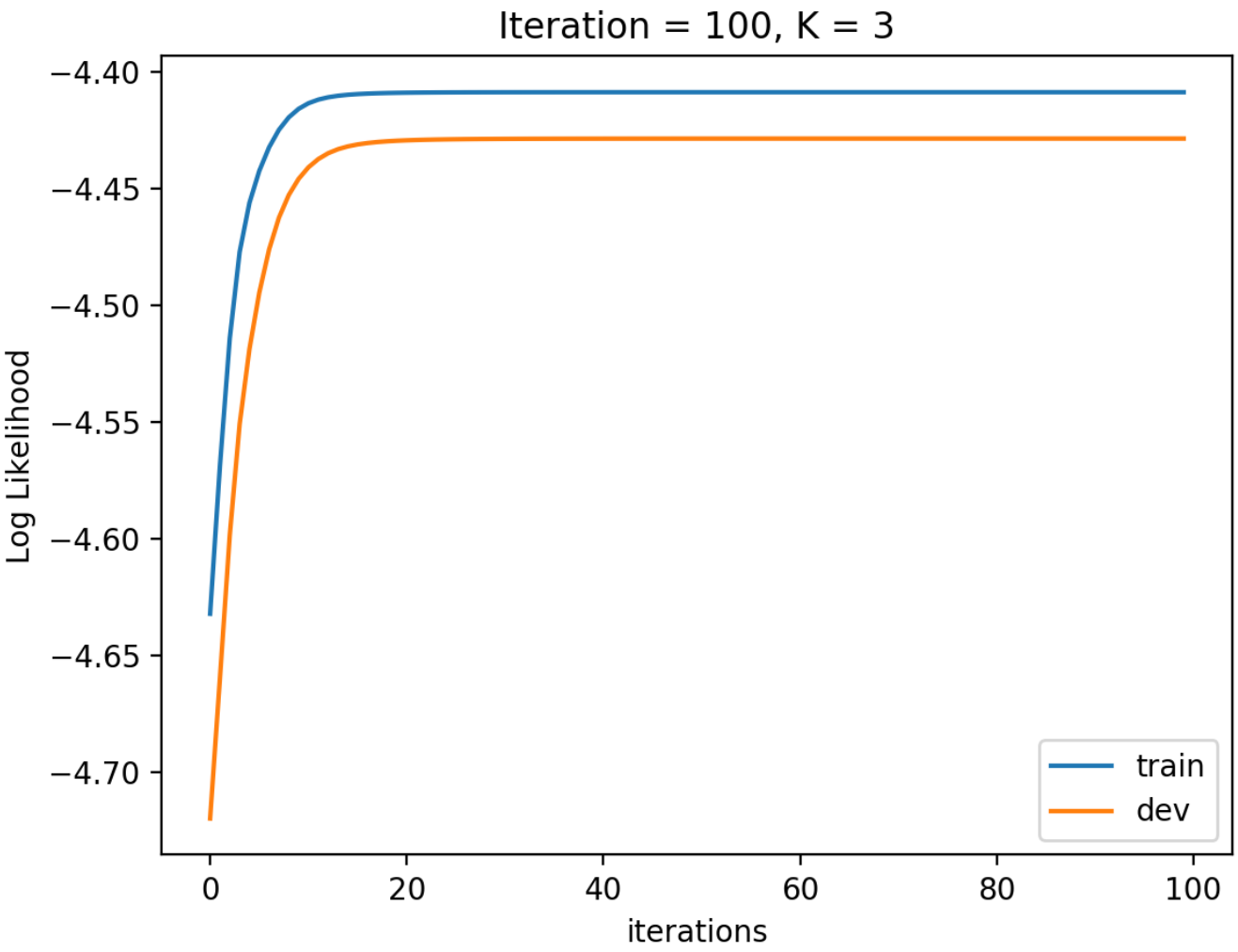
Note: We can clearly see the log likelihood has not converged yet. So we add the iterations number to 50 in the next experiment

Iteration = 50



Note: We see the log likelihood is converging roughly after 20 iterations. But to be same, we train the model again using 100 iterations to see the trend

Iteration = 100

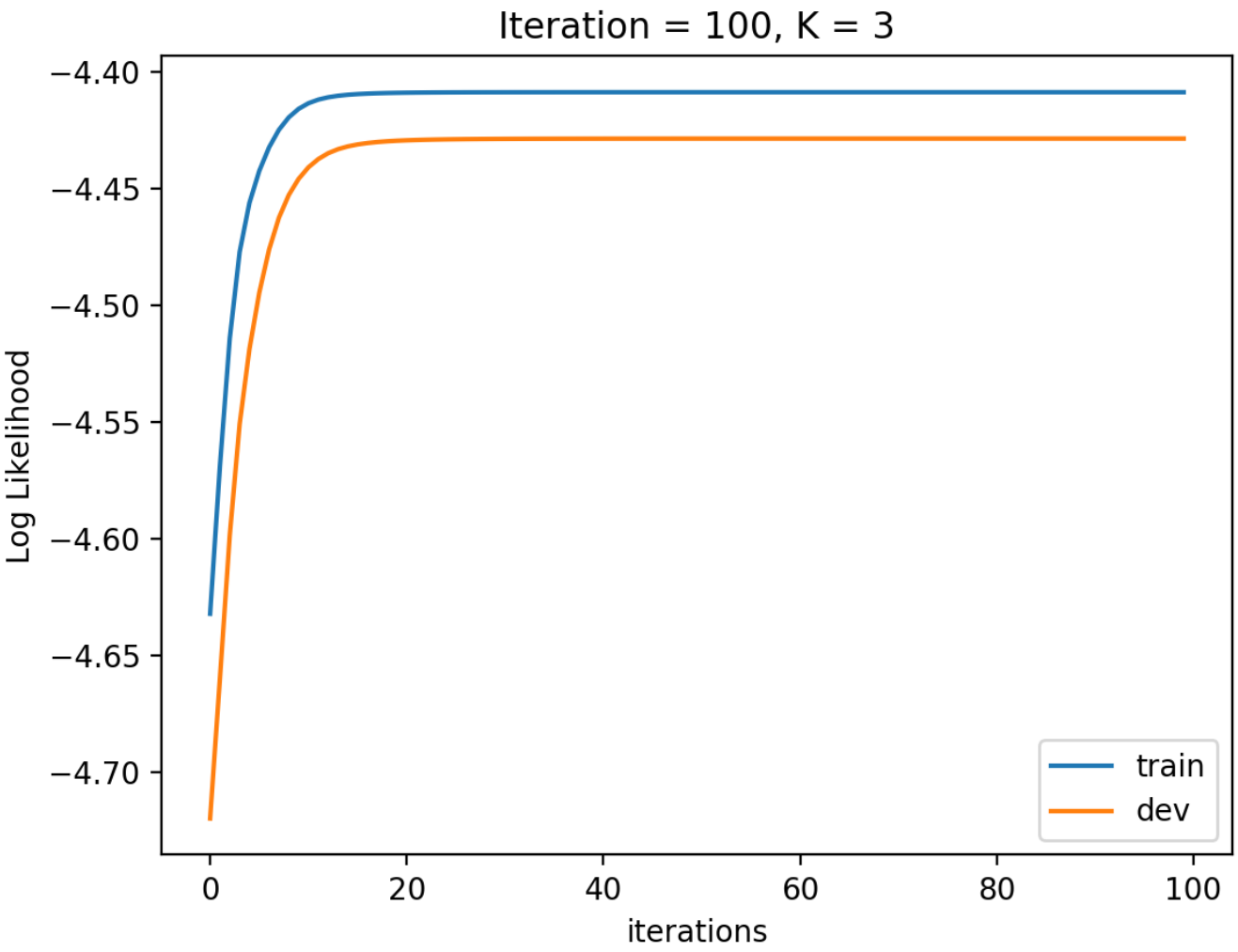


Note: From the graph above, it is reasonable to say that the model is converged after 100 iterations

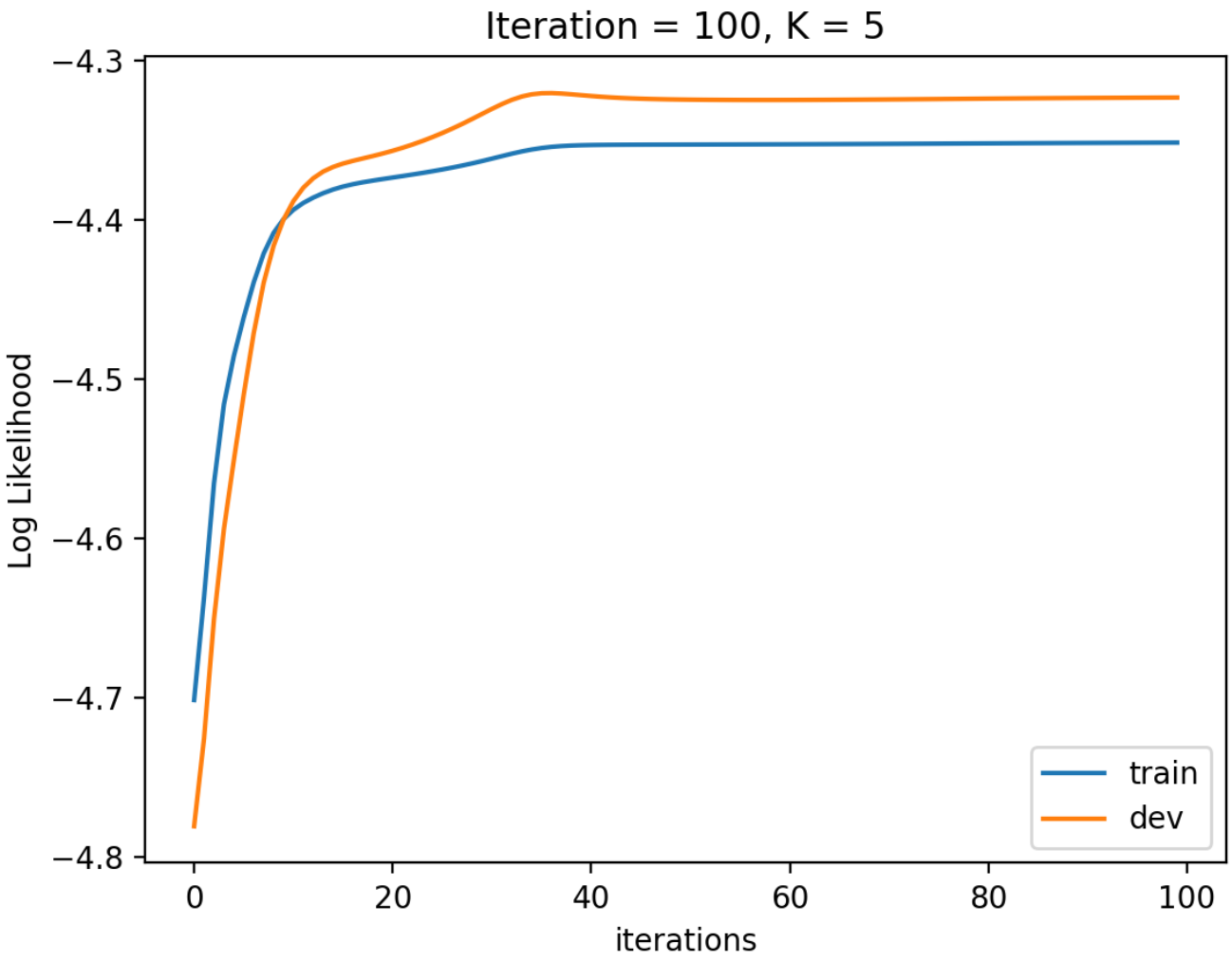
Tuning of `--cluster_num`

After knowing that 100 iterations is enough to have the model converge under the assumption that $K = 3$, where K denotes the the number of clusters, I then tried different values for `--cluster_num` to see how many clusters is suitable for our dataset

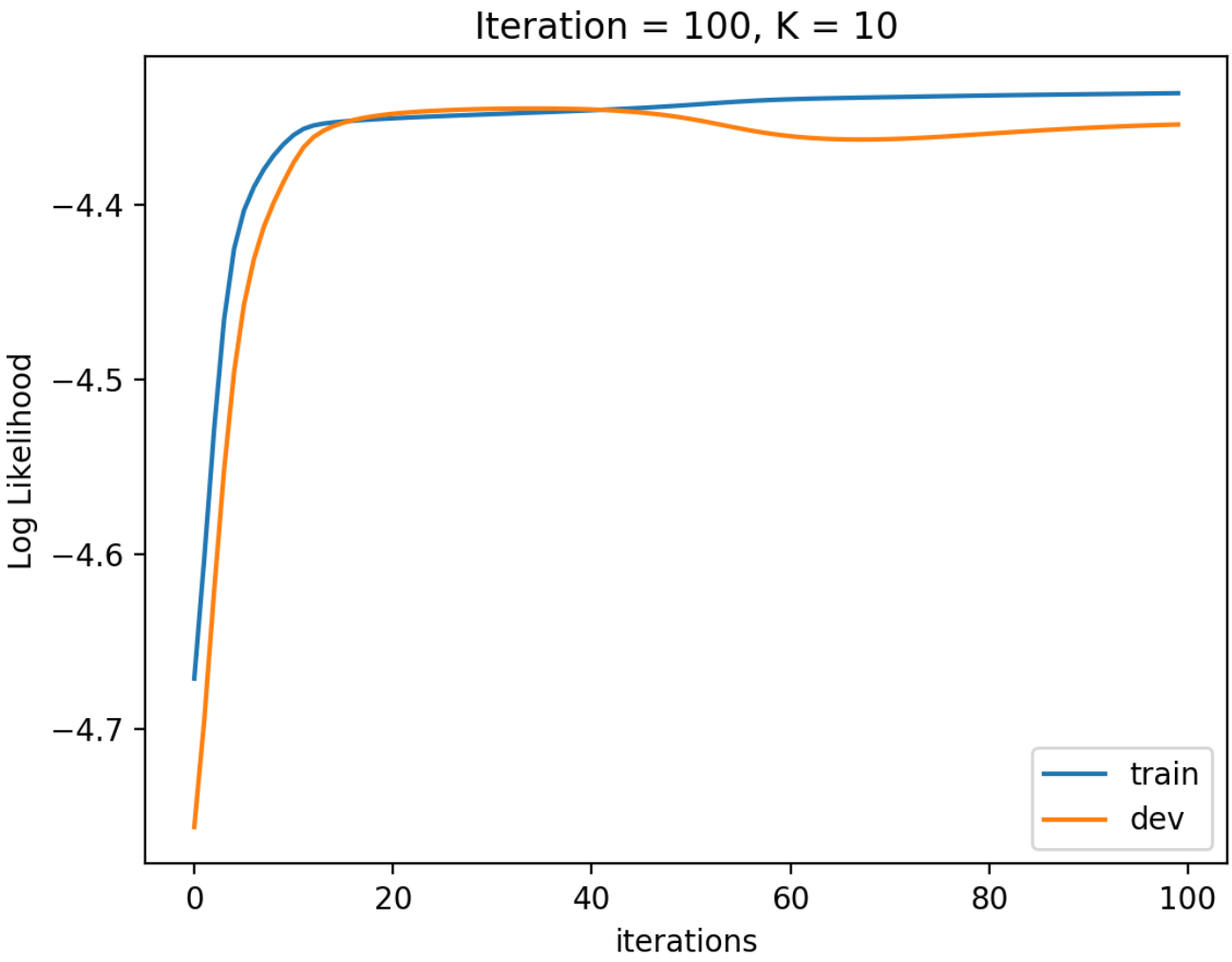
K = 3


Iteration = 100, K = 3
−4.40
−4.45
−4.50
−4.55
−4.60
−4.65
−4.70
Log Likelihood
0
20
40
60
80
100
iterations
train
dev

K = 5


Iteration = 100, K = 5
−4.3
−4.4
−4.5
−4.6
−4.7
−4.8
Log Likelihood
0
20
40
60
80
100
iterations
train
dev

K = 10



Note:

From the 3 experiments above, using $K = 3, 5, 10$, we can clearly see when $K = 5$, the model has the best performance.

- Although model with `K = 3` is not overfitting, it does not achieve better performance compared to model with `K = 5`
- model with `K = 5` has highest log likelihood among the three
- model with `K = 10` is clearly overfitting on the training dataset, resulting in the decline of log likelihood in the `dev` dataset

Conclusion

Based on the experiments above, model with 100 iterations and 5 number of clusters has the best performance among the others